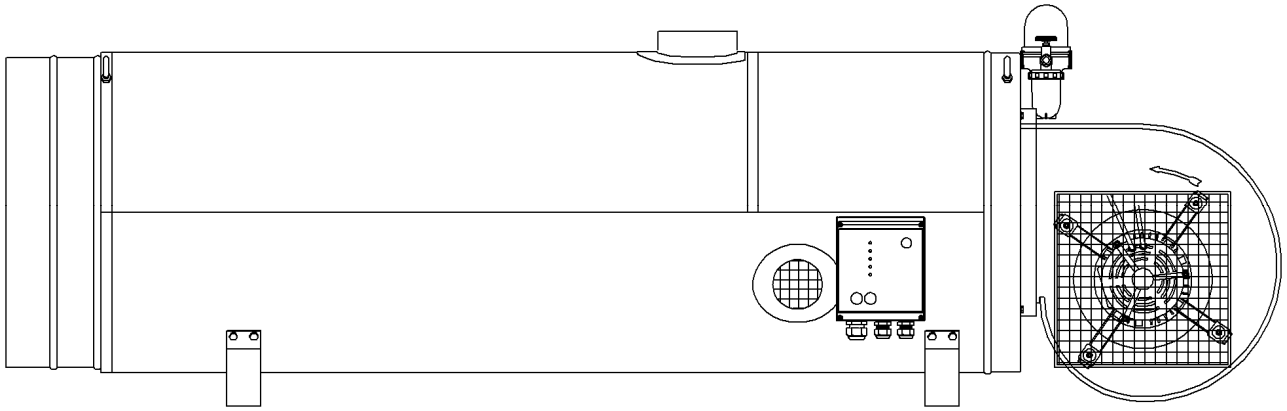
# USER'S MANUAL AND MAINTENANCE INSTRUCTIONS OIL-FIRED AIR HEATERS



# RGA60 BCU
# RGA95 BCU

CE

The heater described in this manual meets the requirements of the following EEC directives:
• Machine Directive 89/392/EEC
• Low-voltage Directive 73/23/EEC

Issue: 13.09

**Congratulations on your purchase!**

**We're sure you'll be very happy with your new**

# RGA60/95 BCU
## HEATER

CE

**EC Declaration of Conformity**

**We declare that the design and model of the machine described above being placed on the market by ourselves complies with the relevant health and safety requirements of the EC Directive.**

**NOTE**

**In order to ensure that your new equipment will always work properly and efficiently and to ensure your personal safety, we would ask you the following:**

**Please read through this User Manual thoroughly and take particular note of the warning and safety instructions before starting up the machine for the first time.**

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# 1. General Information

## 1.1. Symbols

You will see the following symbols when you read through the User Manual:

| | |
|---|---|
| | Warning of a general danger |
| | Warning of dangerous voltage |
| | Wear protective gloves |

## 1.2. Special safety instructions

| | | |
|---|---|---|
| | **CAUTION** | This indicates risks or unsafe processes which can easily cause slight injury or damage to property. |
| | **NOTE** | This provides information on how to handle the equipment effectively, economically and in an environmentally sound manner. |

## 1.3. General safety regulations

This equipment may only be used for the purpose for which it is intended.

Use of the equipment for any other purpose shall be regarded as improper use. The manufacturer will not be liable for any damage resulting from improper use; the user shall bear the sole risk thereof.

Proper use of the equipment also entails observing the manufacturer's conditions of operation, maintenance and installation.

Currently applicable accident prevention regulations and all other generally recognised rules of occupational medicine and safety must be observed.

Check all safety and operational equipment to ensure that it is safe and fully operational:

- before starting up
- at reasonable intervals
- after any modifications or maintenance work

### 1.4. Electrical equipment

- Any work extending beyond the scope of equipment maintenance must be performed by a specialist only.
- Always follow local- and national regulations.
- The heater must always be connected to the mains electrical supply via an earthed socket.
- Keep the socket within reach.
- Always disconnect the appliance from the mains before performing any work on it.
- Never remove the safety grill while the heater is active or could be activated.
- Before starting up the appliance, examine all electrical wiring for any visible defects.
- Change any damaged wiring before switching on the appliance.
- Never remove the plug from the socket while the heater is active.
- Always allow the heater to cool down.
- Never use the heater while any component is missing.
- Have any plug devices that are damaged or destroyed replaced by a qualified electrician.
- Do not pull the plug out of the socket by the flex.
- Covering electric motors can cause high temperatures to build up, which can destroy the electrical equipment and cause fires.

### 1.5. Maintenance

Always disconnect the appliance from the mains before working on the electrical equipment!

Repairs should only be carried out by persons who have the training, knowledge or practical experience to ensure that the repair is done properly.
Maintenance, repair and cleaning work should only be carried out with the drive switched off and the motor idle. The same applies to the rectification of functional defects.

Wear protective gloves if there is a danger of injuring your hands!

The user must satisfy himself that the appliance or machine has been returned to its proper state after carrying out repair work. Technical equipment must not be re-started until all safety devices are in place.

Spare parts must at least correspond to the technical requirements specified by the manufacturer of the equipment. This will be the case if, for example, original spares are used.

### 1.6. Ordering spare parts

When ordering spare parts, always indicate the following:
- Code no. and description of part or item number with description and manual number for uncoded parts;
- Number of original invoice;
- Electricity supply, e.g. 230/400 V, 3 ph, 50 Hz.

### 1.7. Liability

Any unlawful alterations to the machine or the software will rule out manufacturer liability for any resultant damage.

### 1.8. Interruptions

We recommend installing warning systems to monitor your operating equipment. This will protect your animals and plants and consequently your economic existence.

In the case of a power failure, the emergency power unit should automatically switch on.

Power units with cardan transmission for attachment to tractors are also suitable for use as emergency power units. Please consult your property insurance company for More information.

### 1.9. First Aid

Unless explicitly specified otherwise, there should always be a first aid box at the workplace in case of accidents. Any material removed from the first aid box must be replaced immediately.

**when you ask for help, always provide the following information:**
• where the accident happened;
• what happened;
• how many persons injured;
• what the risk of injury is;
• who is reporting the accident!

### 1.10. Discharge

After the installation or repairs of the installation, the packaging and non-usable waste should be delivered to the appropriate places.

The contents of this manual are liable to change without notice.
If you discover any errors or inaccurate information, we would be grateful if you could inform us of these.
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# 2. Introduction

## 2.1. Equipment description

RGA air heaters are ideal for heating in greenhouses and plastic tunnels. The heaters are also excellent for heating workshops and tents (MRGA), poultry sheds or pig sties, or for heating or frost protection in areas used for the storage and/or preservation of potatoes, tuberous crops and the like.

Particularly in their initial stages of life, young animals need a lot of heat, no matter whether they are poultry or pigs. Optimum temperatures right from the start have a decisive impact on their development, health and general performance.

With **ERMAF's** RGA 60 - RGA 95 the exhaust gases are transferred through a heat exchanger and then discharged through the chimney. The remaining hot air contains no flue gases, is odourless and 100% clean.

The RGA 95 has two versions: The agriculture version with axial ventilator and the horticulture with radial ventilator.

The automatic burner guarantees a fully automatic and safe operation, automatic computer control for heating and ventilation.
Heating and ventilation can be controlled either manually, automatically, by a thermostat or by a computer.

The RGA is controlled by thermostat or by computer; it also has a photocell control. If for some reason the appliance does not ignite or the flame is extinguished, the oil supply is immediately cut off. A solenoid valve unit ensures high levels of safety. No oil can escape unburnt.

## 2.2. Special safety regulations

| | |
|---|---|
| ⚠ | The RGA 60 - RGA 95 are heaters for use in mentioned rooms. Use of the equipment for any other purpose shall be regarded as improper use. The manufacturer will not be liable for any damage resulting from improper use; the user shall bear the sole risk thereof. |

Notice:
No account is taken with general hazard of fire in this manual. Consult your fire insurance company and/ or your local fire brigade for more information.

## 3. Technical data

**Oil-Fired Warm Air Heaters with flue gas exhaust**

| Type (between brackets: MRGA) | | | RGA 60 | RGA 95 horticulture | RGA 95 agriculture |
|---|---|---|---|---|---|
| Capacity | | kW | 60 | 95 | 95 |
| Fuel consumption | | ltr/h | 6 | 10 | 10 |
| Air output | (230V)<br>(400V) | $m^3/h$<br>$m^3/h$ | 5600<br>- | 7000<br>8000 | 7000<br>8000 |
| Motor speed<br>Motor speed burner | | RPM<br>RPM | 1400<br>2860 | 950<br>2860 | 2850<br>2860 |
| Mains | 50-60Hz<br>50Hz | V<br>V | 230<br>- | 230<br>400 | 230<br>- |
| Electric current | 230V-50Hz<br>400V-50Hz | A<br>A | 2,9<br>- | 5,0<br>3 x 3,0 | 5,0<br>- |
| Power | 230V-50Hz<br>400V-50Hz | W<br>W | 670<br>- | 850<br>1220 | 900<br>- |
| Throw ventilator | (230V)<br>(400V) | m<br>m | 35<br>- | 50<br>60 | 50<br>- |
| Weight | | Kg | 81.5 | 127 | 125 |
| Length | | mm | 1645 (1750) | 2175 (2285) | 2100(2310) |
| Width | | mm | 720 (710) | 785 (730) | 785 (730) |
| Height | | mm | 635 (1135) | 710 (1215) | 710 (1215) |
| Tank capacity (MRGA) | | ltr. | (160) | (160) | (160) |

The heaters consists of **5 main components**:

1. Shell : used for leading air.
2. Kettle : gives off heat to the airflow.
3. Burner : the oil/air mixture is (spark-) ignited and burnt, transported through the kettle to the chimney.
4. Ventilator : this conveys the hot air along the kettle into the room. The RGA 95 has two versions: The agriculture version with axial ventilator and the horticulture with radial ventilator.
4. BCU : this contains the regulation and safety apparatus.

**Description of materials:**

Shell : high-grade 304 stainless steel/ sheet-steel
Burner chamber : high-grade 430 stainless steel
Tank : sheet-steel

The materials used are capable of withstanding maximum loads.

## 4. Installation Instructions

### 4.1. Number required

The number of heaters required depends on the size and nature of the room, the required temperature and the relevant climate zone.

### 4.2. Installation

| | | |
|---|---|---|
| | **CAUTION** | The following points must be observed! |

- The heater must be properly secured using the suspensions eyes or resting on a stable base (see chapter 13).
- The heater must be as close to the horizontal as possible and certainly not inclined at an angle of more than fifteen degrees.
- No inflammable objects should be placed within three metres of its outlet, maintain a free space of 1 meter above the heater.
- Always disconnect from mains before maintenance or moving (MRGA).
- Always let the heater cool down after a burning period.
- Keep well clear of the main ventilator when the service hatch is opened.
- Ventilate your room to avoid oxygen depletion
- The oil used as fuel must be purified.
- Check the fuel supply lines regularly for leaks and loose fittings.
- Read and follow the safety instructions.

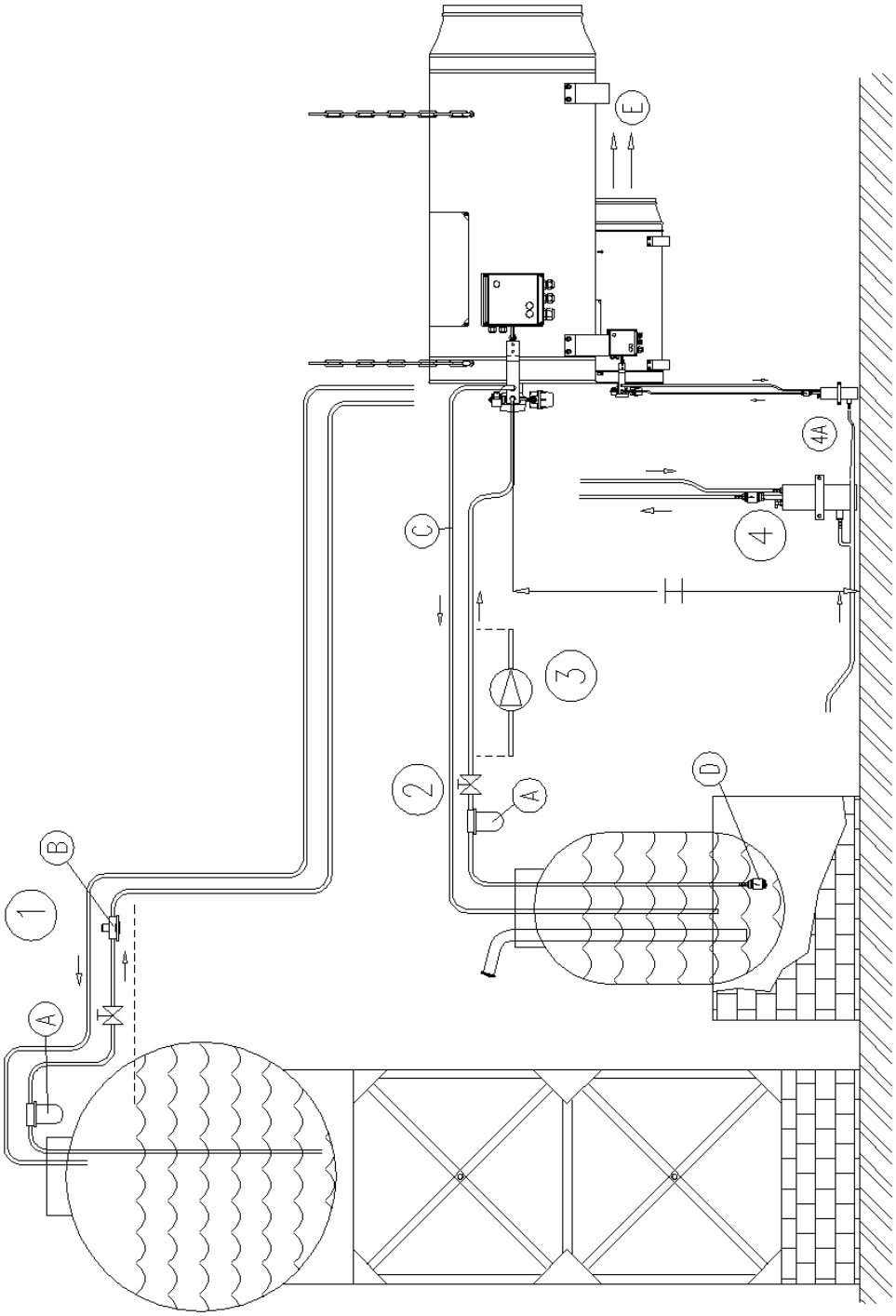
### 4.3. Connecting the oil supply

The following features of the oil supply system must be compatible with one another:

- The total length of fuel hose or pipe used (i.e. fuel hose run)
- The diameter of the fuel hose
- The height difference between the oil tank and the heater
- The type of fuel to be used

The next table below shows the permissible combinations. Make sure that the oil supply system complies with this table. The figures in the table have been worked out on the assumption that the heater is higher than the oil tank.

**Connection Oilcircuit**




Explanation drawing:

A. Always use a filter when the oil or the filter can be dirty
B. Transfer Valve
C. Pipe up to 3 / 8 ", larger sizes can cause bubbles.
D. Check valve
E. Consider the distance to the food and drink stalls and installation of plants in greenhouses because of dehydration.

FUEL : Kerosene 2.15 $mm^2/s$ (cST).
Diesel 6.00 $mm^2/s$ (cST).
H = Height from bottom oil tank - oil pump in the heater (m).
ø = Internal diameter oil hose (mm).
L = Maximum length oil hose (m).

| **Oil (max viscosity 1,5° E at 20°C)** | | | |
|---|---|---|---|
| **H [m]** | **ø8 L [m]** | **ø10 L [m]** | **Ø12 L [m]** |
| 0 | 28 | 64 | 100 |
| 0,5 | 25 | 58 | 100 |
| 1,0 | 22 | 52 | 100 |
| 1,5 | 19 | 46 | 100 |
| 2,0 | 17 | 40 | 100 |
| 2,5 | 14 | 34 | 80 |
| 3,0 | 12 | 28 | 66 |
| 3,5 | 8 | 24 | 55 |
| 4,0 | - | 18 | 45 |

| | |
|---|---|
| ⚠ | Always use oil-resistant hose and compatible hose clips ! |

The fittings supplied with the heater as standard are for use with fuel hose which is ø8 mm. If larger-diameter fuel hose is used, suitable hose clips must also be fitted.

**Connecting the oil supply**

Once the heater is in position and you have selected the appropriate fuel hose, proceed as follows:

| | |
|---|---|
| ⚠ | Mind the following points! |

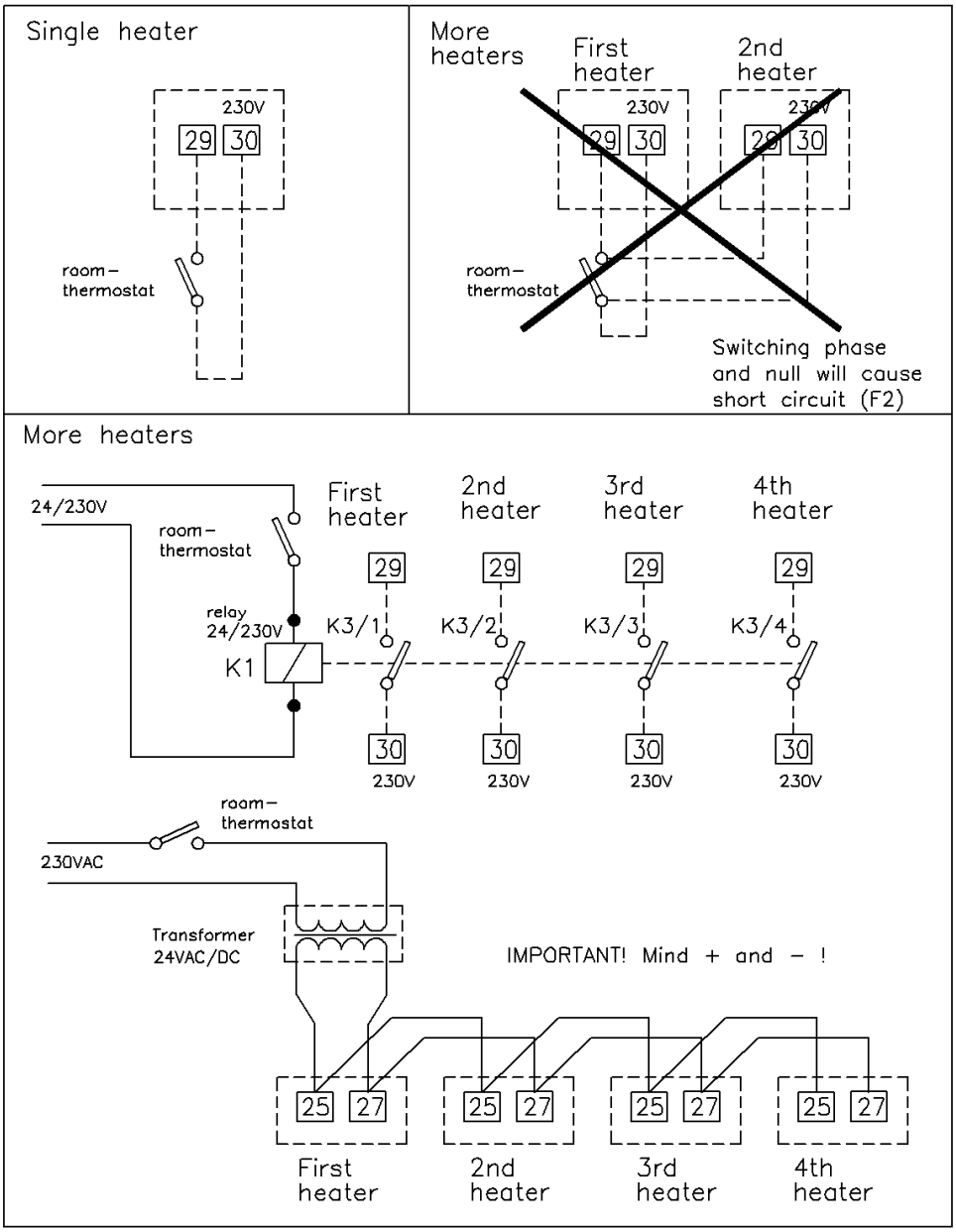
- Do not allow the fuel hose to trail along the ground. Always secure them to a wall or a steel framework.
- The oil tank must meet the relevant environmental standards and must be contained within a spillage sump. The capacity of the sump must be at least the same as the capacity of the tank. The sump must be protected from the rain.
- Keep the supply line 5 cm free from the bottom of the tank to prevent dirt entering the system.

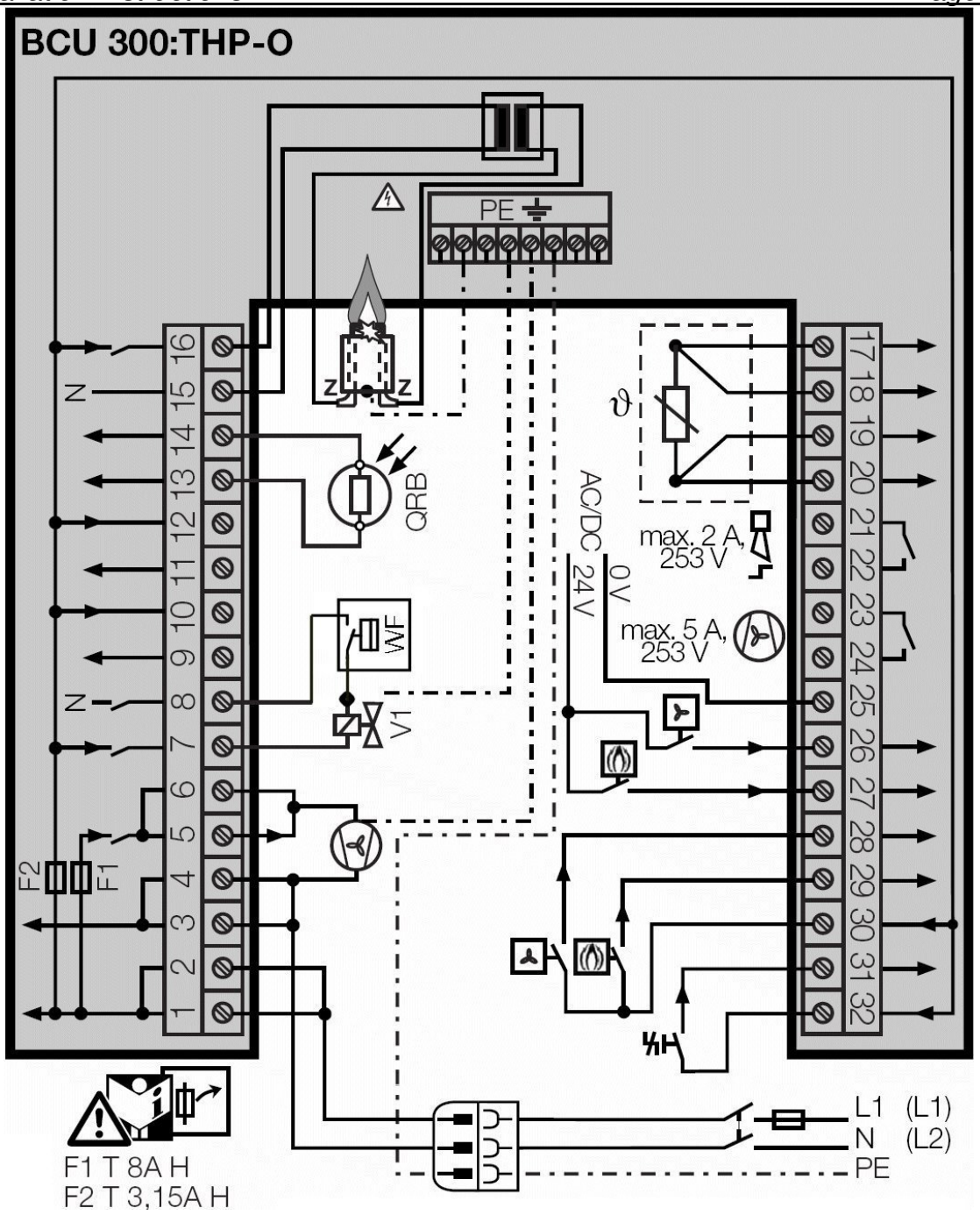
**4.4. Electrical Connections**

Unscrew the lid from the BCU and pull it off straight with both hands.
The connection of the thermostat, external signals etc. are described below:
(Wiring max. 2,5 $mm^2$.)

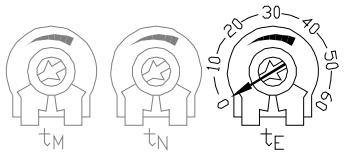
| | | | |
|---|---|---|---|
| 1(2), 3(4) | Mains connection 230V | | |
| 21,22 | Contact for optional external error signal (Light/klaxon, max. 253 V / 2 A !) | | |
| 23, 24 | Contact for extra Ventilator<br>(Switches simultaneously with Ventilator appliance; **max. 253 V / 5 A !**) | | |
| 25<br>26<br>27 | 24VAC/DC ( - ) in<br>Signal “Ventilate” 24VAC/DC( + ) in<br>Signal “Heating” 24VAC/DC( + ) in | | |
| 28<br>29<br>30 | Signal “Ventilate” 230VAC (from 30) in<br>Signal “Heating” 230VAC (from 30) in<br>230VAC (for 28 and 29) out | ⚠ | **WARNING**<br>**Do NOT connect other heaters on contacts 28 till 32 (Phase sensitive)** |
| 31, 32 | Optional connection for external reset button (contact) | | |

Do NOT use different phases.

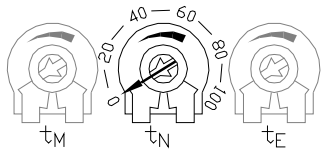
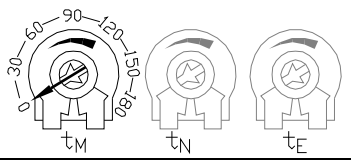





| | |
|---|---|
| Oil valve | Signal ventilate |
| Ventilator | Signal burning |
| Photocell | Alarm signal |
| Wind vane | External reset button |

| | |
|---|---|
| **Starting delay**<br>When multiple appliances start at the same time, some appliances may not get enough tension (230V) or gas(pressure)<br>The BCU (lid) has a potentiometer ($t_E$) with which per appliance a start delay of 0-60 seconds can be set. Per appliance a delay of 5-10 seconds should suffice. |  |

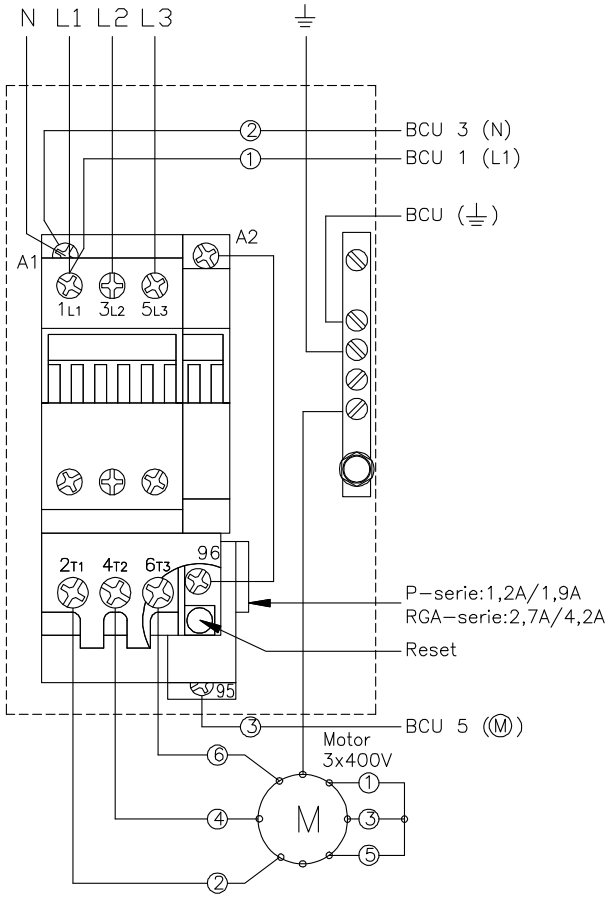
☞ The following settings are set by the producer and should NOT be altered.
**Changes might lead to damage!**

| | |
|---|---|
| **Cooling down period:**<br>A standard of 10 seconds cooling down period is set but a longer period can be set. The middle potentiometer can add 0 to 100 seconds |  |
| **Minimal burning time**<br>Every time a appliance starts, there is a short incomplete combustion<br>A minimal burning time can be set with the left potentiometer, with which also life expectancy of relays, engine and other parts can be lengthened. (Only necessary when room thermostat is set too sensitive)<br>Range: 0-180 Seconds |  |

Put the BCU lid **straight** back to its socket and tighten it with the screws.

### 4.4.1. 3x400VAC Connections (Option)

| | | |
|---|---|---|
| ⚠ | **Warning** | Only horticulture equiped with radial ventilator |




| Name | Code nr. |
|---|---|
| Box empty | |
| Danfoss CI9 relay..... | N51400081 |
| Danfoss thermic relay TI 16 2,7-4,2 A | N51900079 |
| Box complete | |

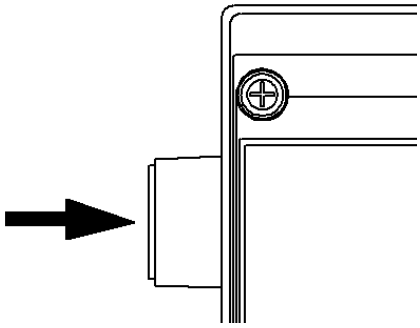
# 5. Commissioning

## 5.1. Commissioning

Before using the heater, read the safety instructions and make sure that the heater, fuel lines, oil tank, electrical supply and room thermostat are connected as described.

Check the oil in the oil tank and proceed as follows:

1. Open all oil relevant valves.
2. Connect the heater to the mains.
3. Eventually switch heater “OFF”
4. Push the red button on the side of the BCU.
   The burner ventilator will start turning and the oil pump will begin drawing oil from the tank. Wait until oil fills up the oil filter. Once this stage is reached, the oil system is ready.
5. Repeat this with all other heaters



The heaters are now ready for use.

## 5.2. Room thermostat

For the heater to be regulated automatically, the BCU has to be in mode “automatic”. Set the room thermostat to the required temperature. When the room temperature falls below the set level, the heater will start and will keep heating until the temperature reaches the set level.

Depending on the type of room thermostat in use and where it’s positioned, the room temperature is able to vary within a band either side of the temperature to which the thermostat is set. The difference between the temperature at which the room thermostat cuts in and the temperature at which it cuts out is referred to as the thermostat's differential. The smaller the thermostat's differential, the more often the heater will come on and go off.

| | | |
|---|---|---|
| ☞ | **NOTE** | We advise using a room thermostat with a differential of ± 2°C.<br>It will activate the heater when the room temperature drops 1°C below the set temperature, and deactivate when the room temperature rises 1°C above the set temperature. Using a thermostat of this kind will reduce the likelihood of faults and improve the performance of your heater. |

**Disconnecting the heater**

To disconnect the heater, wait until it is inactive and the fan has stopped (let it cool-down properly), then remove the mains plug from the socket.

## 6. Operation

Press the white button (ON/OFF) of the BCU until one of the other LED's light up, the appliance is switched "on" in the last chosen setting.

By pushing the red button continuously, different settings can be chosen (the chosen setting will start after 3 seconds)

| | | ***Error*** |
|---|---|---|
| OFF | Appliance will not react to any signal | *1* |
| AUTO | Appliance waits for a signal from the thermostat for heating or ventilating | *2* |
| | Appliance will start burning (manual setting) | *3* |
| | The ventilator will start running (and only this) | *4* |
| + AUTO | Appliance will ventilate continuously and waits for a signal from the thermostat for heating. | *5* |

When the heater is activated, the main- and burner ventilator start turning. The oil pump mounted on the burner ventilator draws fuel from the tank, the ventilator provides the oxygen needed for combustion. The main ventilator switches a wind vane for checking (cooling) airflow.

The ignition from the ignition transformer is activated at the same time as the ventilator. It is audible by a soft crackling noise.

After about 30 seconds, a voltage of 230 V is applied to the oil pump's magnetic valve causing it to open. (audible by a soft "click"). Once the valve is open, fuel is pumped to the oil atomising nozzle, from which it emerges as a spray, which is immediately ignited by the ignition spark.

About two seconds after the burner has lit, the ignition system is deactivated. This helps prolong the life of the transformer; continuous ignition is in any case unnecessary because the heater uses a high-pressure system.

During operation, the heater is monitored and regulated by an automatic control box, the BCU, connected to a photocell, which monitors the flame in the combustion chamber. If a fault is detected when the heater is activated or while it is in operation - if, for instance, the oil supply fails or there is insufficient oxygen - the heater will immediately lock out. When this happens, all the components mentioned above except for the ventilators are automatically deactivated and the heater ceases to function. The red lockout indicator on the BCU will light as well as one or more small LED's which point to the kind or error. If the reset button is pressed, the heater will start up again. However, if the fault has not been corrected, the heater will simply lock out once more.
For advice on what to do if your heater develops a fault, see chapter 9.

When the heater is deactivated or locks out automatically, the flame goes out but the fan will continue to run for about a minute to cool down the heater. When temperature rises above a specific level again after the cooling period, the ventilator will cool again, and again if necessary.

| | | |
|---|---|---|
| | **CAUTION** | The "ventilate" mode is particularly useful in the summer. However, you must make sure that there is enough oil in the tank, since the oil pump could seize if it is not being lubricated by the oil. |

## 7. Protecting the environment

Before leaving the factory, the heaters are tuned to keep the emission of harmful substances to a minimum.
Nevertheless, the combustion system will not function optimally if, for instance

- there is a shortage of oxygen
- the wrong fuel is used
- there is a leak in the oil supply system
- water gets into the oil tank (this can also damage the oil pump) or
- dirt gets into the oil supply system.

Poor combustion can be harmful not only to the environment.
Therefore, have your heater checked regularly to see that the combustion system is in good working order.
Also, follow the safety and installation instructions closely. Service the heater at least once a year.
Your oil storage arrangements must meet the relevant environmental standards. In other words, the tank must be contained within a spillage sump, the capacity of which must be at least the same as the capacity of the tank. The sump must also be protected from the rain.

Regularly check the heater and the fuel hoses for leaks.
If you have reason to disconnect a heater (say, to move it or replace it), make sure to catch the oil that runs out of the fuel lines and filter and dispose of it in an environmentally responsible manner.

## 8. Maintenance

| | | |
|---|---|---|
| | **CAUTION** | Never use water to clean the heater!<br>Inadequate cleaning can result in serious damage. |

- Regularly check the heater(s) and all fuel hoses for loose connections and leaks.
- If you use the heater seasonally, check that it is in good working order well before you need to use it, so that you have time to deal with any unexpected problems.
- Always disconnect the mains before carrying out maintenance work, always isolate the heater from the mains electrical supply by removing the mains plug from the socket.
- Periodically wipe the outside of the heater with a soft cloth. A small amount of a non-aggressive cleaning liquid may be used, but the heater must be thoroughly dried afterwards. Do not clean the heater with water.
- Remove the burner from the inside of the heater and clean with compressed air. To do this you will need to remove the service hatch on top of the heater.
- Check the photocell and its housing (in the burner) for dirt and, if necessary, clean with a soft cloth. The photocell can only be replaced in one (correct) way.
- If you think that the heater or its combustion system is not working properly, consult an approved engineer. Approved engineers have special equipment with which they can check the heater thoroughly.
- Check the oil filter, if it is dirty; clean it. Be sure to replace the rubber O-ring when reassembling the filter.

After carrying out maintenance work, make sure that all components you have removed from the heater are correctly replaced.

## 9 Dealing with faults

If the heater develops a fault, it will lock out completely and the red lockout indicator light on the BCU will come on. The heater can be started again by pressing the lockout-reset button on the BCU. However, if the fault is not corrected, the heater will simply lock out once more.

| | | |
|---|---|---|
| ☞ | **NOTE** | If the heater should lock out repeatedly, do not press the lockout-reset button more than three times. If the heater keeps locking out, isolate it from the mains electrical supply by removing the mains plug from the socket and contact an approved engineer. |

- Remember that heaters only lock out when there is something wrong. So if your heater locks out, it may be faulty, there may be a problem with the heating system as a whole or with the room or space in which the heater is being used.
- If a component (e.g. the oil atomising nozzle, pump or photocell) needs to be replaced, the new component must be of an identical type. Failure to use the correct component may compromise the heater's safety or performance.

### Fault Diagnosis

Turn the heater on (press the lockout reset button), then make the following checks:

1. Are both ventilators running?
2. Is there a good ignition spark?
3. Does the oil valve open after about fifteen seconds? (Audible by click)
4. Does the burner light?
5. Does ignition spark disappear about two seconds after igniting the burner?

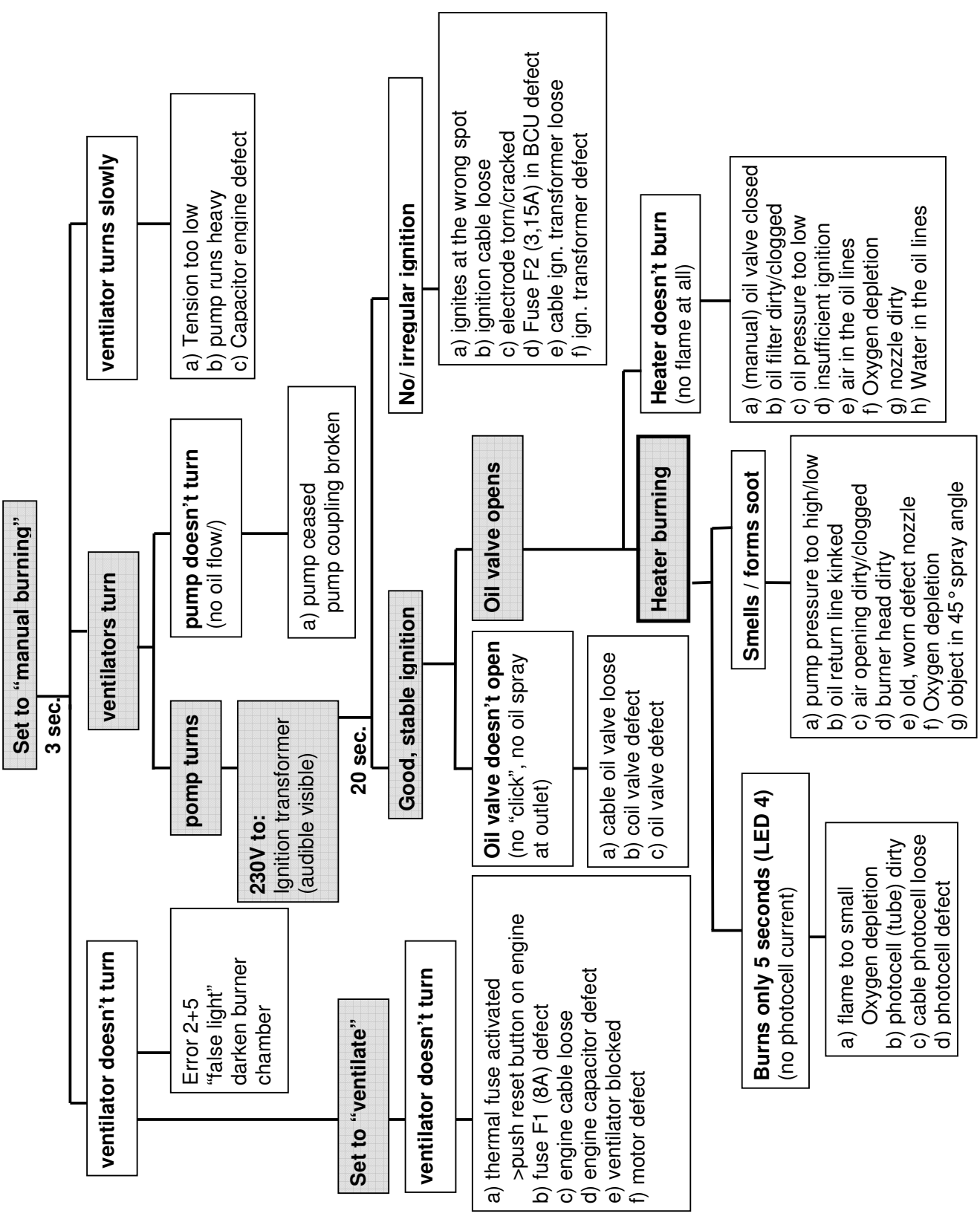
If any of these reveal a problem, you are half way to finding out what is wrong.

The big red LED on the BCU shows a malfunction. The internal malfunction contact (21,22) closes. The kind of malfunction is shown by the flashing red LED's (No. 1-5). See next page.

To reset the appliance the red button should be pushed for at least 1/2 a second.

| | |
|---|---|
| ⚠ | • High-tension danger! Disconnect power before working on this heater!<br>• Only authorised people should<br>• Do not try to repair the BCU, guarantee will be void and a safe operation cannot be guaranteed!<br>• To (remotely) reset the heater in principle only by authorised personnel and under supervision of the heater. |

# Flow chart RGA60/95 BCU



**List of possible malfunctions**

| LED | Malfunction | Cause (■) / Solution (►) |
|---|---|---|
| **4** | BCU did not recognise a flame during the safety time.<br><br>There will be no automatic start attempt | ■ Wind vane doesn't switch (main ventilator not turning?)<br>■ Oil valve doesn't open –> check functioning<br>■ No (adequate) ignition<br>►Check distance electrodes; check connection ignition cable; clean ignition electrode; check ignition<br>■ Bad flame signal caused by wrong setting burner<br>►Adjust burner (pressure) properly<br>■ Not enough light current caused by dirty or badly connected photocell (-pipe)<br>►clean photocell (-pipe); also check the cable<br>■ Air in the oil supply -> Bleed oil pump/conduits<br>■ Short circuit at ignition- or oil valve connection BCU<br>► Check wiring. |
| | **Advise:**<br>When a short circuit is found at the oil valve exit, the BCU should be sent back to the manufacturer, or:<br>1. Replace fuse F2: 3,15 A (slow, H) and check security function<br>2. Close manual oil valve.<br>3. Start the appliance for a few times and check security function<br>4. When a malfunction is detected, send the BCU to the manufacturer.<br>**WARNING!** When this security function is not checked, the oil valves may stay open and unburned oil might flow into the room – **Danger of explosion!** | |
| **5** | Max. temperature of overheat cut off device (STB) exceeded. (manual reset needed) | ■ Ventilator does not cool down<br>■ Dirt ► Clean |
| **4+5*** | Max. temperature of overheat guard device (STW) exceeded. (automatic reset) | ► Set a longer cooling down period<br>■ Dirt ► Clean |
| **2+5** | Premature flame signal (before a flame is possible) | ► Faulty flame signal. |
| **1+5** | Incorrect function of overheat cut off/guard device | ► check connections<br>■ Temperature sensor is below –20°C |
| **3+4*** | Time between two starts is too short. (automatic reset after waiting time) | |
| **2+4** | Flame dropped during operation (Heaters with 3 start attempts will make a new start when the heater has burnt for at least 2 seconds) | ■ Bad flame signal caused by wrong setting burner<br>► Adjust burner (pressure) properly<br>■ Bad flame signal caused by dirty or badly connected photocell.<br>►Clean photocell (-pipe); also check cable |
| **1+4** | Remote reset (connection 31/32) is switched longer than 10 seconds. (Permanent reset) | ► Only push reset when appliance has a malfunction |
| **1+3** | Flame signal did not dissipate within 5 seconds after the oil valves closed -> Oil valves do not close properly. | ► close oil supply<br>► check correct functioning burner / oil valves |
| **1+2** | Internal tension error | |
| **3+4+5** | During a malfunction more than 5 times in 15 minutes the remote reset (connection 31/32) is switched. (automatic reset after waiting time) | |

Errors indicated with a * will reset automatically after the problem has dissolved, sometimes after a small pause. Pushing the reset-button in this case has no use.

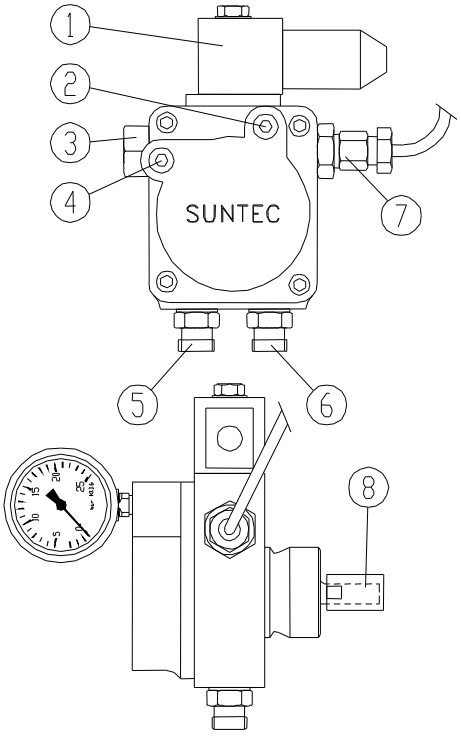
## 10. Fitting Instructions

| | | |
|---|---|---|
| ⚠ | **CAUTION** | This chapter is intended for approved fitters and **not** for users. |

**Removing the burner**
The burner can easily be removed by unscrewing the 4 bolts from the kettle.
For searching and solving problems, it is easier to remove the burner from the kettle.
The burner can be lit (mind a safe distance from flammable objects) and a fault can be observed. During startup the photocell should be kept in the dark to prevent false light.
As soon as the burner is lit the photocell must "see" the light.

**Pump pressure**

The heater's pump pressure is set at the factory. However, it is good practice to check the pump pressure from time to time - when the heater is serviced, for instance. Pump pressure should always be checked if the heater develops a fault, or if the burner is not operating properly. Check the pump pressure using a good pressure gauge with a range of 0 to 16 bar or 0 to 25 bar. The location of the pump's pressure gauge port and pressure adjustment screw are shown in the diagram below.




1. Solenoid valve
2. Pressure gauge port
3. Adjustment screw pump pressure
4. Vacuum meter gauge port
5. Return port
6. Inlet port
7. Port to nozzle
8. Pump coupling 8 mm

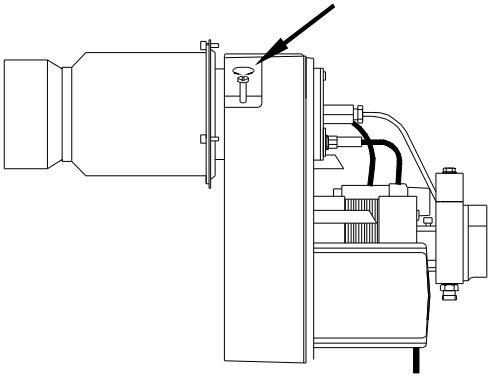
The pump pressures in burning condition:

| | |
|---|---|
| RGA60 | **9 bar (± 1)** |
| RGA95 | **8 bar (± 1)** |

The pump pressure can therefore often best be set on the basis of observed combustion performance and the emissions:
RGA60: $CO_2$ (±10%), CO (<10ppm) and soot (0%).
RGA95: $CO_2$ (±12,5%), CO (<10ppm) and soot (0%).
However, problems are not necessarily down to incorrect pump pressure alone; the nozzle or air supply may (also) require attention.

**Air supply**

During tuning of the burner, the pump pressure (quantity of fuel) and the air supply are very important. When too much air is supplied, the heater could manifest ignition problems (the spark could be blown off) and efficiency will be low. With a lack of sufficient air, the heater may start producing soot which may in turn choke the kettle.



The air supply can be adjusted by a screw on the side of the burner.
When using a hose or tube to extract fresh air for the burner, connect it on the inlet before adjusting the air supply.

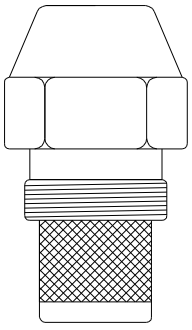
Adjust the air supply to form ±12,5% $CO_2$ at the chimney outlet.
Always check for (absence of) soot after adjustment.

**Oil atomising Nozzle**

The oil-atomising nozzle and the pump pressure together determine the output of the heater. After a few years, the nozzle can become worn and may as a result deliver too much or too little oil. This in turn leads to the combustion problems described under "Pump pressure".
If too little fuel is being delivered, and the pump pressure is correct, check to see whether there are any blockages in the fuel system - dirt in the oil filter, or in the nozzle filter, for instance. If no blockages are found, the nozzle should be replaced.
If too much fuel is being delivered, and the pump pressure is correct, check to see whether there are any leaks in the heater. If no leaks are found, the nozzle should be replaced.

If the oil-atomising nozzle needs replacing, be sure to replace it with a genuine nozzle of the same make and type. The heater is designed and adjusted to suit that particular make and model of nozzle. (The same applies when replacing any other components).
After a new nozzle has been fitted, the adjustment of the ignition electrodes and the orifice should be checked (see diagram in the next chapter).
The correct nozzles for the various models of heaters shown in the table below.

| Type heater | **RGA 60** | **RGA 95** | **RGA 95 E** |
|---|---|---|---|
| Brand nozzle | DANFOSS | DANFOSS | DANFOSS |
| Capacity US-gal/h | 1,35 | 2,25 | 2,25 |
| Capacity ltr./h | 6 | 9 | 9 |
| type of nozzle | 45°S | 45°S | 45°S |
| ERMAF nr. | N51900071 | N51900072 | N51900072 |



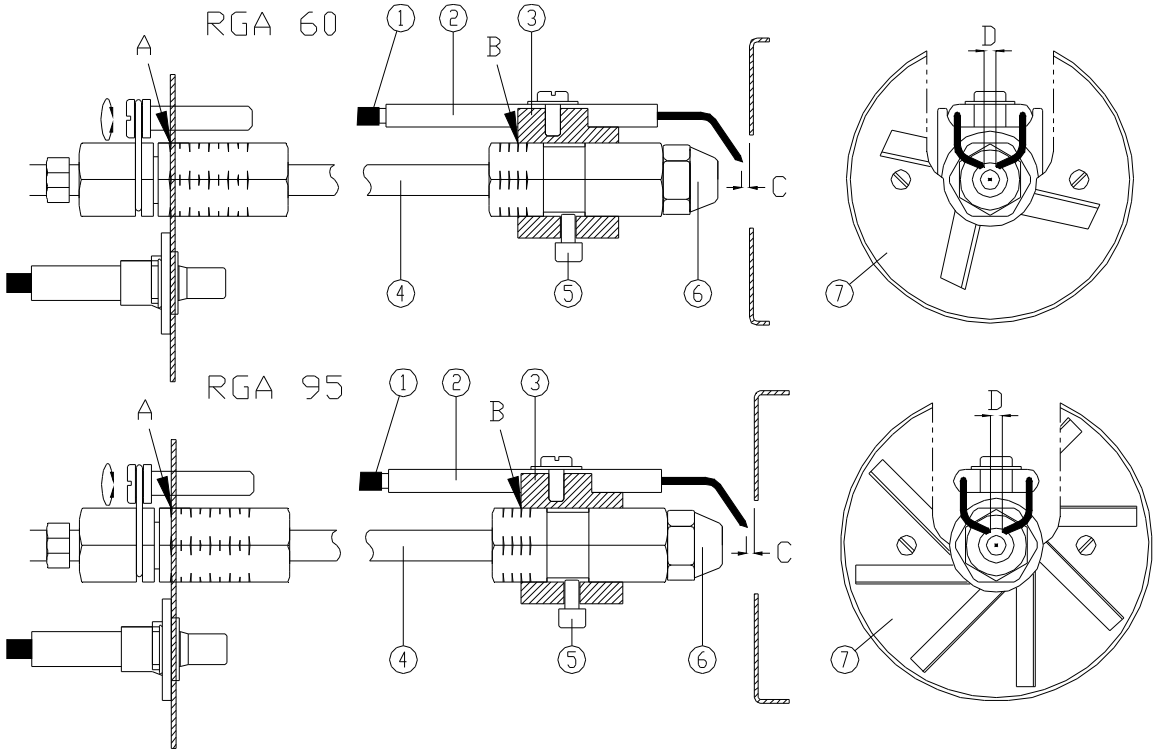
**Ignition System**

The ignition system is a vital part of your oil-fired air heater. Its function is to light the oil coming out of the nozzle, and it must be capable of doing so under adverse conditions such as extreme cold. It is therefore very important that it is properly adjusted. If the ignition system is badly adjusted, the ignition spark may form in the wrong place, or may not form at all. This will cause the heater to lock out.

If you look in at the front when the (removed) burner is activated, you should be able to see the ignition system come into operation. Between the two ignition electrodes a well-defined spark should be visible. Under the influence of the air current, the spark should form in front of the nozzle. If you can see a strong spark and it is in the right place, the ignition system should function properly.

If the ignition electrodes should ever need adjusting, adjust them very carefully, because if the electrodes porcelain sleeving breaks or cracks, they will have to be replaced.

The diagrams below show how the ignition system should be adjusted.




1. Spark plug cables..... N51900006
2. Electrodes (set) ..... N51900002
3. Holder for electrodes- en orifice ..... N51900021
4. Pressure oil conduit ..... N51900001
5. Adjustment screw for electrodes- en orifice
6. Nozzle (see previous page)
7. Orifice
   RGA95 :..... N51900019
   RGA60: ..... N51900020

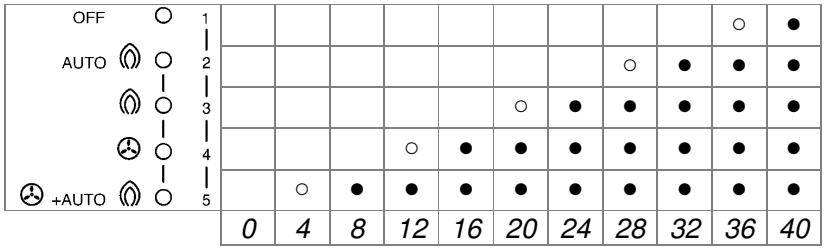
A: Air adjustment: 1st notch
B: Adjustment orifice: 3rd notch
C: Adjustment electrodes: ±1mm
D: Distance electrodes: 3mm

**Photocell**

The photocell is mounted in the rear of the burner. The photocell's function is to check whether there is a flame in the combustion chamber when the heater is activated and while it is in operation. If no flame is detected during activation or when the heater is in operation, the heater will lock out. However, if the photocell is dirty or faulty, it may not detect a flame even when there is one, causing the heater to lock out.

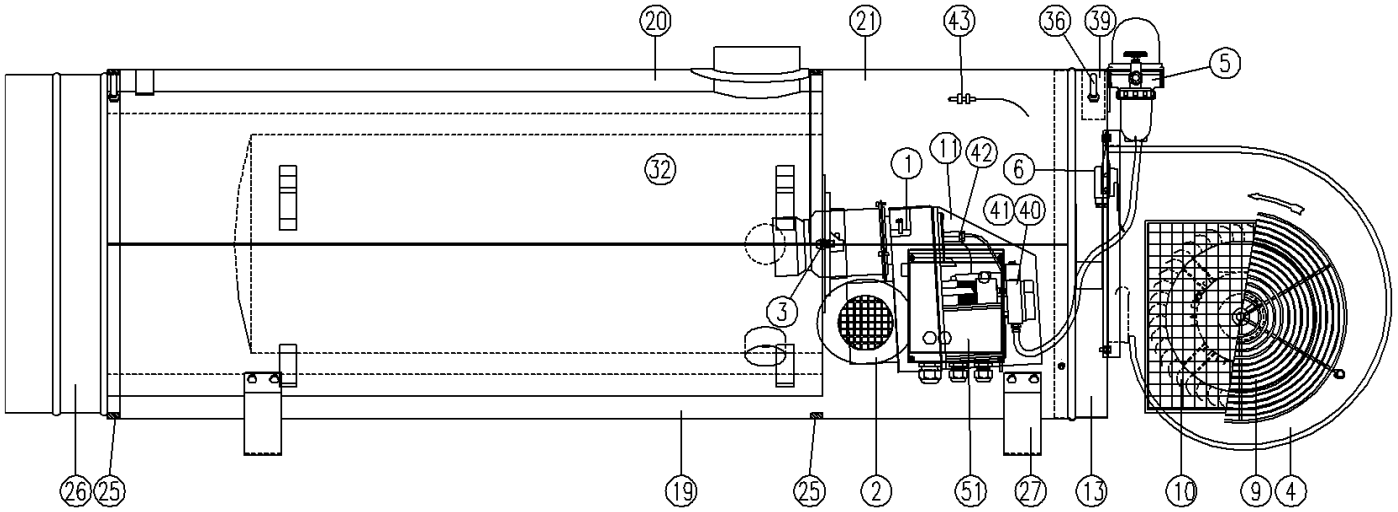
The amount of burning LED's changes per appliance, pump pressure and environment (dust/oxygen), but at least 4 LED's should burn stable.

There are 11 steps:



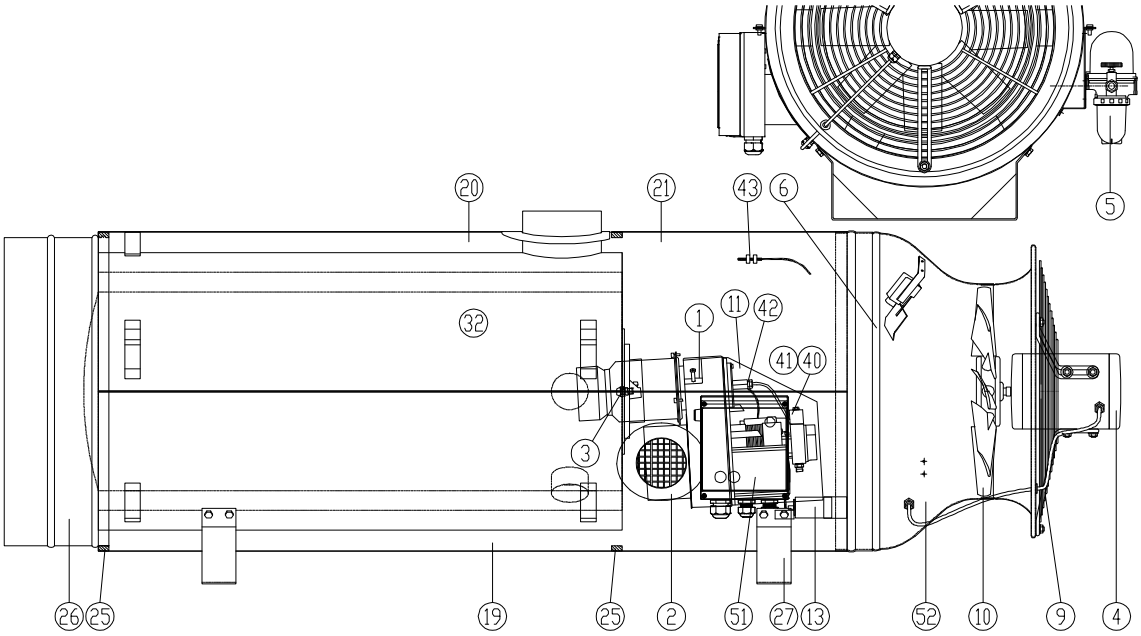

| *0* | *4* | *8* | *12* | *16* | *20* | *24* | *28* | *32* | *36* | *40* | *[µA]* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ○ | ● | |
| | | | | | | | ○ | ● | ● | ● | |
| | | | | | ○ | ● | ● | ● | ● | ● | |
| | | | ○ | ● | ● | ● | ● | ● | ● | ● | |
| | ○ | ● | ● | ● | ● | ● | ● | ● | ● | ● | |

The current should be max. 20µA when the heater is activated and min. 28µA. during normal operation. If the current is more than 20µA when the heater is activated, the photocell is probably being "confused" by light from an external source. If during normal operation the current is less than 28 µA, the photocell is probably weak or dirty, the flame is irregular because the combustion head is dirty or the nozzle is blocked.




Note: Please quote the appliance type and number when ordering!

| Pos. | Name | Code nr. |
|---|---|---|
| 1 | RGA 60: Burner Finterm AZ8 | N51900225 |
| | Gasket AZ8 | N51900013 |
| | RGA 95: Burner Finterm AZ10 | N51900224 |
| | Gasket AZ10 | N51900014 |
| 2 | Air inlet complete RGA | N51900077 |
| 3 | Nozzle Danfoss 45°S | see page 20 |
| 4 | RGA 60: Radial ventilator Nicotra DDC 241-241 (230V) | N52000003 |
| | RGA 95: Radial ventilator Nicotra DDC 321-321 (230V) | N51900051 |
| | RGA 95: Radial ventilator Nicotra DDC 321-321 (400V) | N51900053 |
| 5 | Flow control Oventrop TOC 80 | N51900042 |
| 6 | Wind vane RGA complete | N50390028 |
| 9 | Grille flat EB 35 | N52700006 |
| 10 | Square grille engine side, RGA 60/ 95 | |
| 11 | Cover burner stainless steel (option) | N52100031 |
| 13 | Rear cover complete RGA 60 | N52000005 |
| | Rear cover complete RGA 95 | N52100005 |
| 19 | Lower shell | |
| 20 | Upper shell | |
| 21 | Service hatch RGA 60 | N52000010 |
| | Service hatch RGA 95 | N52100010 |
| 25 | Hoop | |
| 26 | Air outlet complete RGA 60 | N52000012 |
| | Air outlet complete RGA 95 / E | N52100011 |
| 27 | Support mantle | N51700021 |
| 32 | Kettle RGA 60 | N52000014 |
| | Kettle RGA 95 / E | N52100040/0035 |
| 36 | Suspension eye M10x50 | N51900087 |
| 39 | Suspension strip | N51400113 |
| 40 | Oil pump Suntec | N51900054 |
| 41 | Pump coupling RGA (8mm) | N51900055 |
| 42 | Photo cell L&G QRB-1B | N51100017 |
| 43 | TSK1054 Temperatursensor 6x45 1M T.B.V. RGA | N50820039 |
| 51 | BCU RGA oil lid | N51400225 |
| | BCU oil socket (incl. Danfoss EBI ignition transformer) | |
| | Button for pumping oil manually | N51900029 |




| | | |
|---|---|---|
| 04 | Motor Elnor BX275 | N50820001 |
| 10 | Wind vane 400mm white, 8 vanes | N50820029 |
| 13 | condensator 16 UF | N52800034 |
| 09 | Grill RGA100 | N50820031 |
| 52 | Flow connector piece blower RGA95 argriculture | N52400022 |
| 05 | Flow control | N51900042 |
| 06 | Wind vane RGA complete | N50390028 |
| 11 | Cover burner (stainless steel) | N52100031 |

A range of accessories for use when setting up a heater installation or modifying an existing installation is available. The products include:

| | |
|---|---|
| Room thermostat | N50260145 |
| Mounting set for connection to ceiling / roof | N50820037 |
| Fuel hose available in various diameters. Oil-resistant. | |
| Hose clips available in various sizes. | |

**Option: <u>Mobile version</u>**

| | | |
|---|---|---|
| 1 | Cover room thermostat Stainless steel | N51700075 |
| 2 | Room thermostat JET-41 | N50260146 |
| 3 | Cable 3 x 1,5 x 5 mtr. | N51400089 |
| 36 | Push handle | N51700054 |
| 37 | Oil tank 160 lt | N51700029 |
| 38 | Oil tank cap | N51700052 |
| 39 | Wheel ø400mm ø25 massive | N51700050 |
| 40 | End cap wheel ø25 | N51700051 |
| 41 | ¼“ stop to empty tank | N51700053 |

Return of goods form

User name :
Address :
Telephone number :
E-mail address :
Returned by ; Mr./ Mrs :
Date :

| | |
|---|---|
| Description of returned goods | |
| Quantity | |
| Serial number heater<br><br>Power supply<br><br>Working oil pressure | <br><br>V / Hz<br><br>bar |
| Reason for return | |
| Description of failure | |
| Requested action | Credit / Exchange / Repair |
| Remarks | |

Return date ; _____

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